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REPORT ON LAND USE POLICIES AND FARMING SYSTEMS: THE CASE OF SOMALIA AND SUDAN

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FOREWORD

In its programme budget for the biennium 1986-1987, which was endorsed by the eleventh meeting of the Conference of Ministers convened in Addis Ababa in May 1985 and subsequently approved by the fortieth session of the United Nations General Assembly, the Economic Commission for Africa (ECA) incorporated under programme element 3.1 an output described as "Substantive servicing of a seminar on agricultural marketing training and manpower development in Africa" for implementation in the first half of 1986.

In response to this mandate and as a follow-up to the recommendations of a Group Consultation on TCDC for Food Marketing Improvement in Eastern and Southern Africa held in Arusha in November 1985, ECA, jointly with the Food and Agriculture Organization of the United Nations (FAO), organized a seminar on agricultural marketing training and manpower development with a particular focus on food-grain marketing improvement. The seminar, which was attended by marketing officials (mainly regional and agency managers) from nine countries 1/ took place in Harare from 16 to 20 June 1986 at the kind invitation of the Government of Zimbabwe, and the Grain Marketing Board of Zimbabwe.

The principal objective of the seminar was to build up indigenous capacities in agricultural marketing. To this end, participants exchanged views on their national experiences and benefitted from the study of the Grain Marketing Board of Zimbabwe's comprehensive and well-conceived training programme. The seminar aimed thus to enhance the operational impact and managerial efficiency of the participants' marketing institutions within a TCDC framework.

The seminar also addressed the issue of establishing an Association of Food Marketing Agencies in Eastern and Southern Africa (AFMA) which had been recommended by the Arusha meeting in 1985, and the participants benefitted from a field tour of Zimbabwe's grain storage depots and other procurement points.

This report offers a summary of the salient issues raised at the seminar and of the practical measures proposed to improve national capacities in agricultural marketing from the view-point of subregional TCDC arrangements. It consists of a resumé of the opening address by a Zimbabwean Government official and four topical sections. The first section deals with grain marketing policies and operations. The second discusses TCDC activities in grain marketing. The third focuses on the institutional framework for TCDC activities while the last section concludes by summarizing the critical issues discussed and the recommendations agreed upon at the seminar.

1/ Ethiopia, Kenya, Lesotho, Malawi, the Sudan, the United Republic of Tanzania, Uganda, Zambia and Zimbabwe.

I. INTRODUCTION

1. Much has been written in recent years on the precarious food and agricultural situation facing the different African countries. While the index number of total agricultural production for Africa as a whole increased from 93.42 in 1975 to 110.66 in 1985 (1979-1981 = 100), the situation deteriorated significantly during this period, if per caput agricultural production is considered, since population increased significantly during the same period from 413.5 to 555.1 million. Accordingly, the index number of per caput agricultural production declined from 108.35 in 1975 to 95.62 in 1985. In contrast, the corresponding statistics for Asia increased from 94.85 to 111.59 and those for South America from 95.76 to 102.22.

2. The recent FAO in-depth study on agricultural and food problems in Africa concluded that even the present inadequate food supply situation is unsustainable. Unless major policy decisions are taken and implemented to resolve the food production crisis and reduce the rate of population growth, the trends of the past 25 years will continue and the food supply situation will continue to deteriorate during the next 25 years. Famine of the magnitude experienced during the 1983-1984 drought could become a regular feature even in period of more average rainfall.

3. The study further concluded that, if the present trends continue, per caput food production in Africa would steadily decline and that, during the next 25 years, the level of food-sufficiency would be reduced from 52 to 34 per cent in North Africa and from 85 to 56 per cent in sub-Saharan Africa. The cereal deficit would increase almost fourfold to 100 million tons by the year 2010. The cost of cereal imports would escalate sixfold, from the present $US 5,000 million to $US 30,000 million in real terms - or double the estimated value of agricultural exports.

4. Africa can rise to face this critical challenge successfully if available land and water resources are efficiently utilized and if other resources are properly mobilized. Land and water resources are available to meet future requirements, but not necessarily in the areas facing the greatest need. A major part of this staple food crops production is likely to come from rainfed land, some of which may need special management attention due to its fragility. It is possible to have a minimum average annual growth of 3 per cent for the continent, if land and water resources are properly used and managed.

5. Midway through the Lagos Plan of Action, the food and agricultural situation in Africa still continues to be serious. If the problem is to be alleviated, it is clear that Africa's land (and thus water) use and farming systems must receive more attention from policy-makers than they have received in the past. At the last ECA Conference of Ministers, an analysis of land use policies and farming systems in four African countries - Kenya, Mozambique, the United Republic of Tanzania and Zambia - was presented. Under resolution 565 (XXI), the Conference of Ministers requested that this study be extended to other African countries and subregions not already covered. The present report is an extension of this study to the Horn of Africa, especially Somalia and the Sudan.

II. LAND USE AND FARMING SYSTEMS IN THE CONTEXT OF OVERALL DEVELOPMENT

6. Somalia and the Sudan are two of the least developed countries in the world with per capita GNPs in 1984 of $US 260 and $US 360 respectively. Both countries are predominantly agricultural, and this is indicated by the fact that agriculture accounted for 50 per cent of Somalia's GDP in 1982 and 33 per cent of the Sudan's GDP in 1984. In 1985, of the whole economically active population, 73.5 per cent was engaged in agricultural activities (including forestry, fishing and hunting) in Somalia, and 67.9 per cent in the Sudan.

7. The performance of the food and agricultural sector in both countries has been poor during the past decade, and this has led to a rapid increase in external food supplies. Cereal imports during the period 1975-1985 increased from 42,000 metric tons to 330,000 metric tons in Somalia and from 125,000 metric tons to 530,000 metric tons in the Sudan. Simultaneously, between 1974-1975 and 1983-1984, food aid in cereals went up from 111,000 metric tons to 177,000 metric tons in 1983-1984 in Somalia, and from 46,000 metric tons to 450,000 metric tons in the Sudan. The present status is shown in table 1.

Table 1: Food and agricultural situation in Somalia and the Sudan

	Somalia	Sudan
Index numbers (1979-1981 = 100):		
Food production, 1985	103.65	124.55
Cereal production, 1985	143.30	159.92
Livestock products, 1985	99.80	125.00
Index numbers, per capita (1979-1981 = 100):		
Food production, 1985	89.10	108.14
Cereal production, 1985	123.62	139.46
Livestock products, 1985	85.91	108.44
Cereal imports, 1985 (1,000 metric tons)	330	530
Food aid in cereals, 1985 (1,000 metric tons)	177	450
Dairy per capita calorie supply as percentage of requirement, 1983	78	90

8. The performance of both the Somalian and Sudanese economies has been fraught with problems which have resulted in the emergence of the following features: imbalance in aggregate demand and supply, rapidly rising inflation, overvalued exchange rates, balance-of-payments problems, and the sharp rise in foreign debt.

9. At the beginning of this decade, the Sudanese economy was characterized by large deficits in the balance of payments' current account. Export earnings from agricultural commodities (mainly cotton and gum arabic) failed to register the expected increases. The bread basket programme did not generate the expected increase in exports either. The medium- and long-term external debt rose from $US 2.3 billion in 1978 to approximately $US 4.6 billion in 1981.

10. In 1980, the Government of Somalia, supported by the donor community - including the World Bank and the IMF - formulated a programme of policy measures for stabilization and adjustment of the economy. Among measures included in the programme were: exchange rate adjustment, budgetary and monetary restraints including the raising of interest rates, and measures aimed at increasing agricultural production. The programme, which was implemented in the period 1981-1983, had a favourable impact on the recovery of the economy. GDP, for example, grew at an annual rate of 6.4 per cent. The agricultural sector registered a high 14 per cent annual growth average. The inflow of external resources from multilateral, bilateral and private sector sources reduced the pressure on the balance of payments.

11. The failure, in 1984, to enforce the adjustment measures led to a rapid deterioration in the country's economic situation. This is apparent from a comparison of the levels of a few important parameters in 1981-1982 with those of 1984. Government expenditure rose from 26 to 36 per cent of GDP. The budget deficit rose from 12 to 23 per cent. Public sector borrowing from the domestic financial market doubled. Inflation in 1984 rose by 92 per cent. External debt payment arrears rose to $US 218 million and the outstanding debt was estimated at $US 1.4 billion. This disturbing situation prompted the Government to formulate a new economic adjustment and development programme. In many respects, this is similar to the programme implemented in the period 1981-1983.

12. A review of the general aspects relating to the performance of the Somalian and Sudanese economies will clearly underscore the need for a redoubled effort in effecting structural adjustment and growth. Special emphasis should be given to reforms in policies relating to agricultural development. This sector has to play a leading role in promoting the growth of output and export earnings. Land use concerns must be incorporated in the reforms to be introduced in agricultural development.

13. The Governments of Somalia and the Sudan have undertaken thorough analyses of the socio-economic problems faced by their economies. Still required are reforms which would lead to the elimination of the vicious circle of poverty to which the people of both nations are subject. There must be the commitment and the will to implement these reforms, however difficult and painful the task may be.

Compatibility of regional development strategies with those of Somalia and the Sudan

14. Somalia and the Sudan are subscribers to the Lagos Plan of Action and to Africa's Priority Programme for Economic Recovery, 1986-1990 (APPER). Recently, the two countries also contributed to the African submission to the United Nations General Assembly special session on Africa which endorsed the United Nations Programme of Action for African Economic Recovery and Development, 1986-1990 (UN-PAAERD). The development strategies outlined in these plans concur on some principal aspects of the development of economies in the Africa region which relate to the subjects being covered in this paper. The plans advocate as the main themes of Africa's development the following:

(a) Improvement in natural resource management so that sustained future productive utilization is assured;

(b) Leading priority being accorded to the development of the agricultural sector;

(c) In the short and medium term, directing priority to the rehabilitation and improvement of existing infrastructure for agricultural production, health and educational services; and

(d) Development of science and technology to enhance productivity.

15. The development strategies of both Somalia and the Sudan have incorporated these themes.

III. TYPES OF LAND USE

16. Land is used for a variety of purposes, many of which often compete with each other. Since the main focus of this report is on agriculture-related uses of land, uses of land for rainfed and irrigated agriculture, pasture, forestry, and national parks and game reserves only will be considered.

17. Table 2 shows the present status and future potential of various types of uses of land in Somalia and the Sudan. Due to the quality and extent of the data available, the figures given in table 2 and elsewhere in this report should be considered as indicative rather than definitive.

Table 2: Land use in 1,000 ha for Somalia and the Sudan

Type of land	Somalia	Sudan
Total area	63,766	250,581
Land area	62,734	237,600
Arable land	1,050	12,390
Rainfed land:		
Potential	1,740	56,220
Actual in 1982	1,020	10,690
Irrigated land:		
Potential	900	3,300
Actual in 1982	800	1,700
Land under permanent crops	16	58
Permanent pasture	28,350	56,000
Forest and woodland	8,950	47,700
Other land	23,868	121,452

Source: Various FAO publications.

A. Rainfed agriculture

18. Rainfed agriculture is the dominant form of agricultural production in Somalia and the Sudan. The main foodgrains of Somalia are sorghum and maize, and these are mostly produced on rainfed land and occasionally on flood-irrigated land. Considerable rainfed farming occurs between the Juba and Shebelle rivers, especially in the Bay region. Most of the recent growth in grain production has been due to the rapid expansion of rainfed areas.

19. It has been estimated that Somalia has about 8 million ha of cultivable land, of which less than 1 million ha is presently being cultivated. An important land use issue yet to be resolved is to what extent the remaining 7 million ha of potentially cultivable land can actually be cultivated, what would be the division between rainfed and irrigation sectors and what would the investment costs be. According to World Bank estimates, expansion of rainfed farming would require investments in the order of $US 300 per ha (1979 prices) compared to $US 7,500 per ha for irrigation development.

20. The average size of rainfed farms in Somalia is about 5 ha but the area farmed depends on the availability of labour during the peak demand period of weeding. Since farmers continue to use very traditional technology such as the hoe, the extent of land that can be farmed per person is limited. Foodgrain yields are low, in fact among the lowest in Africa, since inputs like fertilizers, pesticides and improved seeds are rarely used. Under these circumstances, families with more labour available generally prefer to channel it to additional livestock holding rather than to use it for crops, as the former is likely to produce better returns.

21. The dryland farmers, who are almost exclusively smallholders, generally adopt a risk-minimization strategy of production. Since land is plentiful, but rainfall erratic and scattered, several plots are cultivated with low plant densities in different areas. This increases the probability that crops in some of the plots can be harvested. All attempts to introduce large-scale mechanized farms in these areas have so far been unsuccessful.

22. Rainfed agriculture is probably the most important single economic activity in the Sudan. Depending on the rainfall, the share of rainfed production in the country's agricultural gross domestic product has varied, from a high of 72 per cent in 1981-1982 (a good year in terms of rainfall) to 57 per cent in 1984-1985 (a bad year). During the 1981-1986 period, the five-year average was 66 per cent. It is estimated that some 14 million people, nearly two-thirds of the total population, depend upon rainfed agriculture for their livelihood.

23. The use of land for rainfed agriculture also plays a crucial role in the country's food security since over 80 per cent of sorghum produced, and most oilseeds, meat and dairy products, come from such areas. While cotton yields have been poor in rainfed areas, averaging only 0.1 to 0.2 tons per ha through the 1970s, cotton still remains an economically attractive crop given the reasonable yields obtainable and rational pricing mechanisms. Rainfed agriculture is also an important net contributor to the Sudan's balance of payments. Among the major exports, this sector contributes 100 per cent of gum arabic (Acacia senegal), sesame, karkade and melon-seed, nearly 75 per cent of livestock and oilseeds, and most of the sorghum. If the net contribution to the balance of payments is considered, rainfed land use becomes more important than irrigated land use since this sector at present uses very few imported inputs such as pesticides and fertilizers. Furthermore, by producing nearly 97.5 per cent of the country's fuelwood and timber requirements, the rainfed sector has prevented a further drain on the country's scarce foreign exchange resources.

24. While rainfed agricultural land use plays, and will continue to play, an increasingly important role in the economies of both countries, it is also the most difficult sector for government intervention. As a general rule, rainfed agriculture is practised by small farmers who are often under-privileged and mostly illiterate. They are the least organized, and lack the resources - or access to them - for agricultural development. Their attitudes tend to be conservative, and they prefer risk-minimization strategies for very good practical reasons. Thus, even though the horizontal expansion of rainfed agriculture is an attractive option for Somalia and the Sudan, increasing the comparatively low present yields will not be an easy task. In many areas, yields are actually declining for a variety of reasons, including soil erosion, decline in soil fertility due to continuous cropping, fluctuating rainfall, use of obsolete production technologies and lack of any research support. In the absence of extension services in the rainfed areas, it will not be an easy task to change the attitudes and practices of small farmers. On the positive side, virtually all the rainfed land is in private hands. Thus, with suitable policy instruments and appropriate production, pricing and infrastructural support, it should be possible to increase yields within a comparatively short timeframe.

B. Irrigated land use

25. The Sudan is an important country in terms of formal irrigation development in Africa, and currently accounts for some 28 per cent of all land area on the continent where such irrigation is practised. Only Egypt surpasses the Sudan in terms of irrigated land use. If the relative importance of irrigation is considered, irrigated areas represent 14.1 per cent of the total area under temporary and permanent crops in the Sudan and 7.2 per cent in Somalia.

26. In the Sudan, the first major irrigation project was the Gezira scheme which was initiated in 1925, when some 300,000 feddans (1 feddan = 0.42 ha.) were irrigated. The Gezira currently covers a land area of over 2 million feddans, which makes it probably the largest irrigation scheme in the world under a single management. The irrigation schemes were originally planned for the growing of cotton primarily as an export crop, and fodder crops were introduced in rotation in order to preserve soil fertility and also for livestock. Initially, dura (sorghum) used to be cultivated mainly as subsistence farming, but gradually wheat and groundnuts have appeared as the new cash crops, partly by replacing fodder and partly by the use of land previously kept fallow. In the past, an eight-course rotation was practised: cotton, fallow, dura, fallow or lubia (hyacinth bean), fallow, cotton, fallow, fallow. However, with declining world cotton prices together with the need to provide better returns to the tenants and to grow more wheat for an increasing urban population, the eight-course rotation was considered to be a very extravagant form of land use. Accordingly, over the years, the old system was replaced by a more intensive and diversified land use pattern. The designed cropping intensity now ranges from about 100 per cent in the Managil extension of the Gezira and Rahad projects to about 66 per cent in the Blue and White Nile pump schemes.

27. With the Nile water-sharing agreements of 1929 and 1959 between Egypt and the Sudan, it has been possible to develop over 4 million feddans of land for irrigation. In addition to the Gezira-Managil scheme, four other major irrigation schemes are: the New Halfa (0.4 million feddan), the Rahad (0.3 million feddan) and the Blue and White Nile pump schemes (0.4 million feddan each) which were initially private schemes and were nationalized in the late 1960s.

28. The total area irrigated in the Sudan has fluctuated considerably over the past years. For instance, the area under irrigation decreased from a high level of 2.673 million feddans in 1935-1936 to a low level of 1.961 million feddans in 1972-1973. The average area irrigated annually during the period 1970-1984 was 2.165 million feddans. On the basis of the latest information available for the 1985-1986 crop season, the total irrigated land used for crop production was 1.651 million feddans (the average for 1979-1980 to 1983-1984 was 1.243 million feddans) and, for cotton, 829,000 feddans (the earlier five-year average was 985,000 feddans). The important factor to consider is, however, the yields of various agricultural products.

29. The yields of the main export crop, cotton, have fluctuated significantly during the past two decades. They declined radically from about 0.61 tons per feddan in the early 1970s to an average of 0.45 tons per feddan during the 1979-1980 to 1983-1984 crop seasons. Yields increased to an average of 0.64 tons per feddan in 1984-1985 but, even at these levels, the Sudan compares poorly with other countries like Egypt where the average yield is nearly twice as much. The total area of cotton plantations remained more or less the same: an average of 935,000 feddans during the period 1979-1980 to 1983-1984 and 993,000 feddans during 1984-1985. The current estimate for the crop season 1985-1986 shows a decline to 829,000 feddans.

30. At the same time, the total irrigated area under other crops (wheat, sorghum, groundnut and millet) increased significantly, by about one-third, from a five-year average during 1979-1980 to 1983-1984 of 1,243,000 feddans to 1,651,000 feddans in 1985-1986. During the same period, the average yield of wheat increased from 0.5 to 0.55 tons per feddan, but groundnut yields declined from 0.809 to 0.644 tons per feddan. Wheat yields in the Gezira and New Halfa schemes are low, around 0.5 tons per feddan compared to northern regions where they are 1.0 tons per feddan.

31. All irrigated cotton schemes in the Sudan are managed by public agricultural corporations which provide most of the inputs like fertilizers, pesticides and seeds as well as services such as maintaining infrastructure, operating field-level irrigation and land preparation. Farmers are given tenancies, with limited responsibilities for agricultural operations like provision of labour, application of irrigation water, tending of crops, cotton picking and transportation to collection systems. The area to be planted with cotton is decided upon by the Government each year; crop rotations and timings and methods of major agricultural operations are determined by the agricultural corporations, and thus the tenants have limited control over which crops to grow and how to grow them.

32. Irrigation, especially flood irrigation, has been practised in Somalia for a considerable period of time, using surface water available from the country's two rivers, the Shebelle and the Juba, which originate in Ethiopia. Both rivers flood twice a year and the average annual flow of the Juba river is about 3.5 to 4 times the flow of the Shebelle. Some 110,000 ha of land are now under uncontrolled flood irrigation.

33. The first controlled irrigation schemes were developed in Somalia for large-scale private plantations by foreign investors. Later, large state farms were established in irrigated areas for settling nomads and also for increasing food production. These state farms were planned with a high degree of mechanization, even though sedentarization of the nomads was one of the main objectives. With the departure of many of the nomads to return to their traditional way of life, the state farms faced some labour shortages which led their managers to decide on even higher degrees of mechanization. This means that these farms have to produce high value export crops with good yields in order to be able to justify the costs of importing equipment and oil. These conditions have not been fulfilled. In general, it seems that the small farms have been more successful than the large state farms in employing more people and producing more food economically.

34. More recently, some minor streams have been diverted for the development of traditional, small-scale irrigation projects which have received some support from the Somali Government and from a few donor agencies. Unfortunately, data on the flow regimes of small streams and wadis are mostly non-existent and, accordingly, these projects have been carried out on the basis of local experience only. Thus, much scope exists for gathering relevant hydrological data, and then for more determined attempts to make such investments in small-scale irrigation projects more economic and efficient. Various other systems have also been developed for collecting surface water runoff and rainwater which could subsequently be used for small-scale irrigation.

35. The floodplains of the Shebelle have been more fully developed than the Juba, even though the Shebelle flow is less, and during low flows, its salinity levels are much higher than those of the Juba. Some 35,000 ha of land, out of a total area of 50,000 ha under controlled irrigation in Somalia, are in the Shebelle region. Irrigation efficiency is low, around 20 per cent, indicating frequent water shortages.

36. Currently irrigated areas need extensive development and rehabilitation. Some of the presently irrigated areas have never been properly levelled or equipped with adequate secondary and tertiary canals. Consequently, on these poorly prepared irrigated lands it is not unusual to find even lower yields than in nearby areas. Many farmers face frequent water shortages and this does not make it easy to introduce irrigation water charges as practised in many other countries. The absence of income from such charges reduces the funds available for proper operation and maintenance of irrigation projects. In addition, farmers have no incentive to save irrigation water. Currently, there is a tax on irrigated land which is higher than the land tax on rainfed agricultural production.

37. Crop yields in both rainfed and irrigated lands in Somalia are among the lowest in Africa. For example, maize yields in 1981 in rainfed areas were around 0.3 to 0.4 tons per ha and in irrigated land 0.8 tons per ha. By introducing improved seeds and increasing the present very limited use of inputs, irrigated maize yields can be improved by 50 per cent, to about 1.2 tons per ha.

C. Rangelands

38. The use of land for grazing plays a crucial role in the lives of people and the economy in Somalia and, to a lesser extent, in the Sudan. It has been estimated that nearly 60 per cent of the Somalian population practises nomadic pastoralism in a harsh environment with marginal land resources in an arid and unreliable climate. This is not surprising since nomadic pastoralism is an effective as well as a practical response to marginal land subjected to low and variable rainfall. Over a considerable period of time, the Somali nomads have developed their pastoral grazing systems and an overall rational strategy for their individual livestock managment units.

39. The patterns of grazing rotation practised by the nomads are dictated by natural conditions such as the availability of drinking water, the presence of feed for livestock, including minerals and salt, and outbreaks of biting flies like qulbe or sibi or the presence of tsetse flies, and also by kinship ties. Even though some of the best dry season grazing areas can be found within the river valleys of Somalia, they are generally avoided if infested by the tsetse fly, the vector of trypanosomiasis. Only under severe drought conditions, when livestock face starvation, will the pastoralist consider running the risk of putting them to graze in such areas. As a general rule, however, the nomads prefer to herd their livestock within traditional grazing areas, degaans, for as long as possible. Thus, movement across degaans is more frequent in drier climates, with more erratic rainfall.

40. In terms of strategy, a mix of four major livestock types (cattle, sheep, goats and camels) occurs throughout the Somalian central rangelands, although proportions vary from place to place. The animals are usually herded separately, especially in dry seasons when they require different watering frequencies and thus have to be grazed within safe distances from watering points. Women and children generally look after cattle and sheep near dry season water points, and goats and milking camels up to 20 km from such points. Young men herd camels further away from the water sources.

41. Reliable estimates of present livestock numbers in Somalia and the Sudan are not available. The Ministry of Planning in Somalia has estimated that in 1984 the country had 5.1 million head of cattle, 6.1 million camels, 13.6 million sheep and 17.1 million goats. The livestock subsector dominates the agricultural sector in Somalia at present, and it is unlikely that rangelands can sustain on a long-term basis, the increases in livestock required to provide a livelihood for the nomadic population which is currently increasing at the rate of 2.2 per cent per annum. In fact, a key policy issue for Somalia's future development has to be how to absorb the additional nomadic population productively, without exceeding the carrying capacity of the land.

42. Under the existing land tenure systems in Somalia and the Sudan, communal grazing of livestock is the norm rather than the exception. Accordingly, rangelands provide the bulk of livestock feed: around 85 per cent in the Sudan and a somewhat higher percentage in Somalia. As both human and animal populations have increased at a high rate in recent years - due partly to the availability of improved human and veterinary health care which has contributed to partial control of the worst diseases, and partly to the suppression of tribal warfare - one of the negative impacts has been overgrazing of the rangelands.

43. An important policy issue for Somalia is how to obtain enough forage from the rangelands on a sustainable basis without exceeding their carrying capacity. Overgrazing is a serious problem, though the Somali nomads are good at using the different pastures available to the maximum benefit of their livestock. With increasing numbers of livestock, the competition to use the same grazing areas has intensified, and it has thus been impossible to prevent overgrazing since the pastures are communal. The earlier informal agreement whereby certain areas were reserved for grazing during jilal (the hot arid season, from December

to March) and others during hagai (the cool season) has now mostly broken down. It is now generally accepted that few, if any, rangeland reserves are available in Somalia which could be used to reduce population pressure in the presently overgrazed areas. There is uncertainty about the equally realistic possibility of increasing forage production in the currently used rangelands as the costs of implementing such measures are not known.

44. The use of rangelands in the Sudan has also created environmental problems due to the imbalance that has taken place as a result of rapidly increasing livestock forage requirements on the one hand, and the reduced carrying capacity of land used for grazing on the other. Against a background of rising human and livestock populations, and the combined effects of agricultural encroachment and fuelwood harvesting, the Sudanese rangelands have come under tremendous pressure. The extent of increased population and livestock pressure can easily be demonstrated by considering the facts that, between the period 1957 to 1977, the human population increased more than sixfold, the number of cattle twenty-onefold, camels sixteenfold, sheep twelvefold and goats eightfold. While, in normal years, livestock owners have some degree of flexibility as to whether to release or retain the animals on the rangelands, there do not appear to be any practical solutions at present to the discontinuity and instability caused by drought.

45. A study by the Ministry of Agriculture in the Sudan in 1985 indicated that the country's available range and forest land is approximately 279.4 feddans, or nearly 50.2 per cent of the total area. Total seasonal forage production from the usable rangeland was estimated in 1979 at about 77.7 million tons which can provide grazing requirements for 22.1 million animal units (AU). The livestock population in 1980-1981 was estimated at 27.7 million animal units, which means that some 5.6 million AU could not be supported on a long-term sustainable basis.

46. Improper use of rangelands has contributed to desertification in both Somalia and the Sudan, although reliable estimates of desertified land are not available. Anecdotal evidence in Somalia indicates that it is fairly common to find patches of sand dune in places where they did not exist a decade ago. A decreasing population of yicib (Cordeauxia edulis), an important dry-season browsing source in part of the central rangelands which also produces nuts suitable for human consumption, is another example. Similarly, in the Sudan, the semi-arid and savannah belts are subjected to desertification. Environmental degradation of land due to improper use will be further discussed later.

47. Lack of basic information on the various components of rangeland-livestock-human interactions, and a proper understanding of the dynamics of their interrelationships, including the existing social, cultural, economic and environmental characteristics, are major constraints which have partly contributed to inappropriate and unsustainable project designs in the past. Thus, not surprisingly, most projects have failed to deliver all the benefits initially anticipated. Better and broader understanding of the significance of agro-pastoralism, including its agronomic, environmental and anthropological implications, is a prerequisite for improved project design and implementation if encouraging results are to be anticipated.

D. Land used for forestry

48. Both Somalia and the Sudan face similar problems in the area of forestry as do other sub-Saharan countries. The aggregated impacts of pressure on land to support increasing human and animal populations, periodic drought, and the general failure to manage forest lands on a sustainable basis have contributed to large-scale deforestation and consequent land degradation. Uncontrolled exploitation of forests, either for agricultural expansion and/or extraction of forest products, including fuelwood, has contributed to "mining" of forest resources. Policies aiming at afforestation and forest conservation have been lacking, or are being poorly implemented, and consequently there has been serious erosion of the overall forestry resource base. Clearly, the pressures to meet the increasing demands for forest products, to convert existing forest lands to land used for agriculture and livestock grazing purposes while simultaneously preserving present forest reserves present the Governments with a policy dilemma which will undoubtedly prove to be a most difficult challenge over the long term.

49. At present, in both Somalia and the Sudan, there are many constraints which hinder the rational use of land for sustainable forest management. Among these constraints are the lack of a reliable and readily accessible data base on forestry, the absence of estimates on present and future production and demand for various forest products, the lack of an up-to-date legislative framework which properly reflects the multi-faceted pressures faced by forests and poor implementation of whatever legislation is available, the shortage of suitable managerial and professional local staff, and the level of financial resources available to the forestry sector. These fundamental weaknesses have contributed to the lack of coherent policies on all aspects of forest management.

50. In Somalia, overall forest resources available are adequate to satisfy national needs since total aggregated natural regeneration exceeds demands for forest products and fuelwood. These demands, however, are met from accessible forest areas because of lack of road networks and inadequate transportation systems. If accessible forests only are considered, their growth would amount to around 20 per cent of all national forest growth and this is contributing to a serious imbalance between growth and demand in specific areas. The total accessible forest area is now assumed to be around 10 million ha with a mean annual growth of about 0.36 m3 per ha. Heavy demand for fuelwood and charcoal, grazing requirements for livestock, and land requirements for settlements and agriculture have been responsible for serious deforestation over extensive areas, in particular around heavily populated centres, including the refugee camps. The problem is now serious in the dense savannah areas.

51. While energy consumption in Somalia is low (around 0.2 Metric Tons Oil Equivalent (TOE) per capita in 1984), most of it is in the form of fuelwood and charcoal. Government estimates indicate that total fuelwood consumption in 1984 was 5.6 million m3, amounting to an average annual per capita consumption of about 0.96m3. (World Bank estimates for 1984, however, are 4 million m3 and per capita consumption of 0.6 m3 per year). Progressive deforestation near towns means fuelwood and charcoal have to be collected and transported over increasingly longer distances, and this is contributing to increasing prices,

environmental degradation and time required by rural women and children to collect their daily requirements. Charcoal supplies for Mogadishu are now coming from the Bay region, some 350 km away.

52. A low and erratic rainfall and inhospitable climate have not helped in promoting afforestation, which has not exceeded 100-200 ha per annum in recent years. Present estimates indicate that annual fuelwood production from rainfed plantation projects is unlikely to be economically viable since establishment costs are around $US 1,000 per ha and fuelwood production is about 4 m^3 per ha per year.

53. The land available for forestry is also under pressure in the Sudan. It is estimated that clearance of forest land to expand the agricultural area, harvesting of fuelwood and other forest products, and overgrazing, have reduced the country's forested area by nearly 20 per cent over the past two decades. Some 40 million m3 of fuelwood are now harvested annually from savannah areas to provide the basic energy needs of about 75 per cent of the Sudan's population. This accounts for nearly 82 per cent of the Sudan's total energy consumption.

54. As in Somalia, forests in the Sudan near cities, towns and villages are disappearing. The natural savannah vegetation surrounding major cities like Khartoum has largely disappeared due to constantly increasing demands for fuelwood. Charcoal is currently being transported over a distance of 500 km or more to the main urban centres.

55. Conflicting demands for land use in natural woodland savannah from fuelwood production and grazing requirements are making sustainable management of the forest areas difficult. Livestock grazing requirements are now exerting tremendous pressure on rangelands and savannah. Nomadic herds often contribute to overgrazing since their feed requirements exceed the carrying capacities of these areas. Traditional solutions like controlled and rotational grazing have not so far been successful with nomads, especially in drought years.

56. A special problem in the Sudan with reference to land use has been the establishment of mechanized farming schemes on previously forested areas. These large-scale land clearance operations have completely removed all trees, including those which would have been sources of seed. These schemes now cover some 4 million ha. Since, under existing regulations, forest land converted to agricultural development can be abandoned with impunity, some of it has now been abandoned after only about three to four years of continuous sorghum production. The purely exploitative nature of these operations has meant that the idled land areas have not regained their vegetative cover due to erosion of top soil and disappearance of seed sources. The natural fertility of the soil has declined, which makes afforestation a more difficult, time-consuming and expensive process.

57. According to the Forestry Commission, not more than 28,500 ha of such land had been reforested by 1982. Since the original promoters have no obligations towards reforestation, rehabilitation of abandoned land has been a slow process. Currently, the policy in the Sudan is to slow down the horizontal expansion of mechanized farming schemes: the emphasis instead is on yield improvement.

58. If the present deforestation process in the Sudan continues uncontrolled, an additional 10 million ha of savannah woodland in the north, representing about two-thirds of the remaining resources in the region, would be lost by the year 2000. This would mean the displacement of at least 30,000 nomadic families, accounting for some 6 per cent of the total nomadic population of the country, and their livestock. The average haulage distance for fuelwood and charcoal to Khartoum and to urban centres in the central province would increase from 500 km to 1,000 km, which would further intensify the currently emerging fuelwood supply crisis in the north. The average cost of fuelwood would increase, which would further degrade the quality of life of the poor. Total elimination of on-farm trees and shelter belts would necessitate the use of agricultural residues as fuel. This would lead to the reduction of organic matter in soil, and this is expected to reduce crop and livestock yields by 15 per cent. Wind erosion and desertification would increase, and so would the siltation in the reservoirs. Imports of manufactured industrial wood products would increase to $US 50 million annually.

59. It would also mean that the Sudan would be faced with an enormous investment programme in the future. If the estimated 20 million ha of forest which is expected to be lost by the year 2000 is to be replaced, investment of at least $US 1,500 million would be required which is beyond the financial resources of the Government at present.

E. National parks and game reserves

60. Use of land for national parks and game reserves is an important component of wildlife preservation and tourism development policies, both of which need more attention and further consideration in Somalia and the Sudan. The two countries have some of the most abundant and diverse wildlife stocks to be found in Africa. This, plus the facts that both countries have large areas of marginal land, sparse human population concentrations and a relative lack of other exploitable natural resources, means that considerable potentials exist for wildlife management and tourism development. These could offer some of the most promising possibilities as essential components of future economic development, as has been accomplished in countries like Kenya. This would, however, require more investment in infrastructure development.

61. In Somalia, the Juba and lower Shebelle regions are the best for wildlife, but Galgudud, Bakool, Mudugh, Bari and West Galbeed are important areas as well. Many species, like the dugong, dibatag, baira, wild ass, Pelzeln's gazelle, the greater Kudu and the sea turtle are either unique to the country or rare in other countries. More than 600 bird species and 100 species of mammal can be found in Somalia. Hunting and trapping are illegal, but poaching is a real problem and is the only way in which wildlife is exploited at present. The National Range Agency is in charge of the 11 game reserves which have been

authorized but so far only Dushbush and Mandera have been developed to some extent. In the absence of entry fees, the game reserves do not generate any resources and, consequently, adequate investment is not available for their management and development.

62. The Sudan also has national parks and game reserve areas. The Southern National Park, which was established in 1939, is the largest in the Sudan (1.6 million ha) and one of the largest in Africa. Since this park is located in a sparsely populated area with marginal soil and high tsetse infestation, wildlife management and tourism could form an appropriate form of land use. Even though the park was established some five decades ago, it has never been properly developed.

63. The Sudan also has many game reserves, some of which are very large like the Boma Plateau Reserve (estimated at 25,000 km2). These reserves have not been properly demarcated, and effective protection against poaching and other illegal activities has yet to be instituted. Adequate maps of these areas are not available. Field surveys and basic ecological studies are necessary to generate basic data so that proper management plans can be formulated.

64. Wildlife in both Somalia and the Sudan is threatened because it competes for land use with pastoralists and farmers and their livestock. Predators are often shot or poisoned because of crop damage, competition for grazing land, or merely as a means of obtaining free meat. These factors, plus illegal poaching, are threatening many species with extinction. An example is the white rhinoceros, which has virtually disappeared from the Nimule National Park in the Sudan, even though the Park had earlier been renowned for this animal.

IV. ASPECTS OF LAND USE

65. Land use planning is undoubtedly a complex issue but when land is used for subsistence purposes, as is the case in many parts of Somalia and the Sudan, issues and problems become even more complex. Attempts at simultaneous fulfilment of certain goals and objectives - such as self-sufficiency in food production, income generation for the purchase of essential goods through production of marketable surpluses and non-farm activities, and diversification of crop production in terms of acceptable risks - are made on the basis of experience gained over years of trial and error in an admittedly somewhat difficult environment. Given the subsistence economy within which the farmers exist and their technological capacities, subsistence farming generally turns out to be a highly effective method of land use. There is usually an equilibrium, albeit at a somewhat low level, between the environment, the skills and technology available, the allocation of resources and the degree of risk acceptable.

66. There are many fundamental factors which finally dictate how land will be used. Among these factors are: physical parameters like soil, water and climate; population; environmental conditions; culture and tradition; level of technology; planning capability; tenurial arrangements, and socio-economic considerations. These factors vary from country to country and, often, from one region to another within the same country. Similarly the problems,

requirements and development needs of farmers and pastoralists can differ from one area to another. In spite of these diversities, however, there are some important similarities between the various aspects of land use and farming systems in Somalia and the Sudan which enable one to make some meaningful and specific comments on certain important aspects.

A. Population - land use interrelationships

67. Population density in the two countries is sparse. For mid-1984, per capita availability of arable land and land under permanent crops was 0.2 ha in Somalia and 0.58 ha in the Sudan. If arable land, land under permanent crops, permanent pasture, and forest and woodlands are all considered, per capita land availability increases to 7.43 ha in Somalia and 5.47 ha in the Sudan. The fragile environment and the limited carrying capacity of the land in the greater part of these two countries make their high population growth one of the major development problems they face. Population growth rates in Somalia and the Sudan were 3.1 and 2.9 per cent respectively over the period 1980-1985. These growth rates imply a near doubling of the 1980 population levels in the two countries by the year 2000. Continuing population increase is a principal cause of over-stocking in the rangelands. It is also a cause of the extension of arable farming to semi-arid light savannah lands in both countries. As discussed elsewhere in this report, this has contributed to desertification of large areas of the northern, eastern and western regions of the Sudan.

68. A Sudanese Government study team on desertification has cited population increase as being a root cause of the malpractices resorted to by the farming community. Outstanding among these have been the extension of cultivation to the country's more arid zones. This has led to the encroachment of sand dunes, particularly in the northern and western parts of the country. Mechanized farming in the Kordofan area and extension of arable farming in the Kordofan and Darfur regions have had disastrous consequences for the environment in these areas. Deforestation, which is occurring as a result of the quest for fuelwood and agricultural development requirements, has been a contributory cause of desertification. These issues will be dealt with in more detail later. Suffice it to say here that the Governments of Somalia and the Sudan must address population issues in relation to the impact they have on land use patterns and the environment.

69. In terms of population-land use interrelationships, not only the human but also the animal population should be considered since both compete to use the land. Needless to say, there is some correlation between human and animal populations. As a main source of animal protein, the number of domestic animals has increased in line with the higher demand for animal products and services arising from the increasing human population. In contrast, the wild animal population has tended to decline as the animals are hunted for their meat and for other commercial attributes such as elephant tusks and rhinoceros horn or as their habitats are gradually destroyed as the land is used for agricultural or pastoral purposes.

B. Land use planning

70. Systematic land use planning approaches have not thus far been adopted in Somalia and the Sudan. Both Governments have initiated a few ad hoc activities related to land use planning. These efforts have resulted in the compilation of data on certain aspects of soil, climate, hydrology and environment in some selected areas. A few maps providing information on rainfall and soils are available. There have also been ecological surveys through which valuable data on range ecologies have been collected.

71. In Somalian Government circles, there is considerable awareness of the desirability of developing detailed data inventories on soils, surface water, groundwater, temperatures, and land use in the country. This has motivated the Government to seek the assistance of UNDP and UNEP to finance and implement a comprehensive land use study over the period 1987-1991.

72. In the Sudan, detailed soil and groundwater data are available on the irrigated areas of the country which, to date, account for about 50 per cent of agricultural output. Soil maps and hydrological data relating to the White and Blue Nile rivers and their principal tributaries are also available and can be utilized for agricultural development planning. The problem, however, still remains for those large areas in the country comprising a wide variety of savannah lands which have considerable potential for agricultural and livestock development but which are also environmentally vulnerable. In these areas, agricultural land use has to be introduced with caution. Large areas of this category of land have already been encroached upon by the desert. Some land use studies have been initiated by the Sudanese Government in the Dorfan and Kordofan regions. Lately the Government established a high-level Land Use Commission. This Commission has comprehensive terms of reference covering the compilation of data on natural resources, environment, hydrology and soils. Its terms of reference include responsibility for co-ordinating the formulation of plans for the utilization of land and natural resources in the country. It has also been assigned to co-ordinate the management of land and natural resource use. The Commission is to be an autonomous body which will be serviced by a secretariat to be established in the office of the Minister of Agriculture.

73. In both countries, the Governments have broadly allocated land resources to forest reserves, national parks, and rangeland for grazing and crop production zones. Because of the limited data on soils, water, climate and social factors, these zoning activities have not been carried out systematically or comprehensively. Recently, conflicts have arisen over the utilization of the various land categories. The compilation of more detailed information should provide a basis for the review of those land use decisions which have been made in the past.

C. Land tenure

74. Land tenure is one of the major important considerations for the restoration, conservation and management of any land-based ecosystem. Traditional communal tenure, which is generally practiced in Somalia and the Sudan by pastoralists, is usually incompatible with long-term sustainable management, especially when

both human and animal populations are increasing, and has often been the main contributory cause of rangeland degradation. This is because, as both human and animal populations continue to increase, at a certain point in time they exceed the carrying capacity of the land. When this occurs, people are unwilling or unable to adjust the stocking rate to the grazing capacity of the area. Co-ordinated control is prevented by two characteristic features of such land use:

(a) Absence of any institution or recognized owner(s), with authority to manage the area as an integrated ecosystem, and who could successfully control the stocking rate; and

(b) Lack of clearly defined and agreed to boundaries within which a controlling authority could exercise required management practices.

75. In Somalia, under the land tenure law of 1975, all the land belongs to the state, and the Ministry of Agriculture is authorized to issue 50-year leases which are both renewable and inheritable for specific parcels of land. A maximum of 30 ha of irrigated land, 50 ha of rainfed cropland, and 100 ha of land for plantations can be leased. If land is left unproductive for two consecutive years, the state can confiscate it. Leases cannot be sold. Under the law, authorities are to inspect and map the leases, and review them if there are any objections. Since there are thousands of leased enclosures in each district, the Government lacks sufficient resources and manpower to inspect and correctly map them, or to enforce the requirement that land has to be confiscated if left unproductive for two consecutive years. Many of the existing "leased" enclosures are not licensed, but ownership is generally respected by the local community under the traditional system. Thus, land tenure is under both legal and traditional arrangements.

76. The ownership of land in the Sudan is also vested with the state. Tenancies were allocated for irrigated land when the schemes were first developed, which in the case of the Gezira was as far back as the 1920s. Legally, tenancies cannot be transferred or sold, but are passed on from parent to children. In reality, however, a survey of the Gezira in 1972 indicated that 75 per cent of all tenancies were half-tenancies, and sharecropping arrangements were widespread. Thus, although tenants on the original list may be de jure tenants they may not be the people who are actually working on the land.

77. Under the provisions of the Investment Act of 1980, the Sudanese Ministry of Finance was empowered to "allot" land. In practice, regional Government officials had considerable authority to allot land, and the Ministry of Finance subsequently confirmed such allotments. However, following the April Revolution, the Transitional Military Council declared that henceforth all land in the Sudan, whether registered or not, belonged to the state.

78. In the areas of the Sudan where irrigated cotton is grown, tenants may hire 70 to 80 per cent of total labour requirements. Since considerably less labour is required for livestock production, livestock rather than crop production is becoming an increasingly attractive economic option to tenants. The situation is more attractive in New Halfa where many nomads have been settled. They have a continued interest in livestock and are more knowledgeable about livestock than about crop production.

79. It is interesting to note that the Steering Committee established by the Sudanese Government to prepare a strategy for the development of rainfed agriculture recommended that in late 1986 all existing mechanized farms should be surveyed and their ownership rights registered. Leases would be granted for a period of 25 years but leases would be extended on an annual basis subject to certification that the "user rights have not been sub-let or fragmented and that the standard land improvements (shelter belts) have been made and recommended rotation is followed". The lease-holder would be entitled to a discount of 10 per cent of the auction price as compensation for land improvements made. All leases would be standardized at 500 feddans. If this recommendation is accepted and implemented, it will mean a radical change in land tenure patterns which is likely to be beneficial.

80. Overall, for both countries, surveys of ownership rights, of land as well as crops and trees, are necessary as the present systems being practised are not very clear. Sometimes the traditional tenure system may prevail and, at times, this system may run counter to formal legislation. For land use planning and for project designs on various aspects of land use, it is essential to have a proper information base on the present situation in terms of land tenure.

D. Land degradation

81. Any serious attempt to formulate rational land use policies and subsequently implement them must take into account not only physical factors like land, water, biota and climate but also environmental, social and economic characteristics and the institutions through which these policies will be formulated and implemented. In addition, land use policies should be flexible and dynamic, so that policies and priorities can reflect changing conditions.

82. One issue which has not received adequate attention in the past is the environmental impact of land use patterns, both short term and long term. While reliable data are not available and the methodological problems of evaluating and quantifying the extent and level of land degradation problems are complex, indications however are that present and past land use patterns have contributed or will contribute to serious land degradation problems in many areas.

83. In both Somalia and the Sudan, the signs of land degradation problems can be seen in many areas due to improper patterns of land use. Sand dunes can now be seen in areas where they did not exist a decade ago. Decreasing populations of desirable vegetation (e.g. yicib in Somalia) due to overgrazing is another example. Use of inappropriate farming practices on comparatively fragile or marginal land, and progressive deforestation for various reasons discussed earlier, are responsible for increasing soil erosion from wind and water, declining soil fertility, reduced water-holding capacity in soil and increasing sedimentation in water bodies. These environmental degradations and the presence of higher human and animal populations are tending to magnify the overall impacts of recurring drought. All these signs are clear indications of the fact that the carrying capacity of land in the affected regions is declining.

84. In Somalia, the establishment of dense areas of agro-pastoralism has caused localized desertification. It is now considered that the active sand dunes in areas around Bargan, Hareeri, Gal, Garable and Jacar were all formed as a result of intensive agro-pastoralism practised some 30 to 200 years ago. New boreholes, introduced with the best of intentions, have often contributed to accelerated desertification. Each new borehole, and thus a permanent source of water, drew a sudden influx of agro-pastoral activities into the surrounding area. Land clearance for agricultural activities and overgrazing around these water points are directly responsible for extensive wind erosion and desertification. Examples of this phenomenon can be seen in villages like Bargan, Galcad, Gal, Hareeri, Jacar and Nooleye. Sand dune formation in Nooleye was first witnessed in 1980.

85. In the Sudan, land degradation is a serious problem. A 1985 report by the Ministry of Agriculture has estimated that drought and desertification are now threatening 4 million feddans of irrigated land, 5.5 million feddans of rainfed mechanized farms, and 16.5 million feddans of traditional rainfed agricultural land. Desert encroachment is also threatening almost 241.8 million feddans of forest land and the Sudan's production of gum arabic which in the past has amounted to 8 to 9 per cent of the country's total exports.

86. Extensive farming of rainfed marginal land in the northern Kordofan, Darfur and White Nile areas has contributed to desertification. As a result of desertification, the movement of sand dunes has accelerated. In the northern Kordofan and northern Darfur regions, shifting sand dunes are now covering formerly productive sandy-clay soils. The area between Dolgo and Karima along the river Nile is now subject to serious sand dune encroachment.

V. CONSTRAINTS TO LAND USE PLANNING

87. There are many constraints to the institution of proper land use planning in Somalia and the Sudan, and only the main ones will be discussed.

A. Data availability and compatibility

88. A prerequisite for efficient land use planning is the availability of adequate data of reasonable quality on all the different aspects of land use. In Somalia and the Sudan, as in most other African countries, inadequate data is a serious constraint on land use planning. Lack of basic data on the various components and dynamics of land use has often resulted in poor and faulty project designs and subsequent project failures.

89. There are many problems which make land use data collection and management a difficult process. First, in spite of the lip service given to the multidisciplinary nature of land use, the approach most commonly considered by most national and international agencies is the preparation of soil maps and inventories. While such data are an integral requirement for land use planning, it has to be noted that they constitute only one aspect of land use. Information on soil, but poor or no data on the area's water and biota, means that no realistic and sustainable land use plans can be formulated. For example, the location, abundance and reliability of water availability are among the most crucial determinants of land use in Somalia and the Sudan. Rural water

development is therefore a central element in land use planning. And yet integration of data in terms of soil, water and biota by specific area is not generally carried out. Furthermore, long-term sustainable land use planning should not be limited to physical factors only. It also requires consideration of social, economic, environmental and cultural characteristics so that various cause-and-effect relationships, together with the present nature and future consequences of specific action or inaction, can be assessed. Without a proper understanding of these interrelationships, it is not possible to develop appropriate land use plans.

90. Lack of trained manpower and of the availability of adequate funds for equipment, hardware and other related facilities is often the primary reason for seriously incomplete or only nominally complete data bases. The accuracy of available data is unpredictable and cannot generally be ascertained due to the absence of trained land use specialists who could properly formulate and supervise the data collection, analysis and reporting processes. Such data would then need to be analysed and managed. Planners and policy-makers must have ready access to the information generated whenever necessary. Unfortunately, even when reasonable quantities of land use data for a specific area have been collected and analysed, they are often not easily accessible because of inadequate data storage and management facilities.

91. In the Sudan, some progress has been made in surveying the entire savannah belt of the country (1.2 million km2) using satellite data in collaboration with FAO. Initial products will comprise up-to-date vegetation maps with scales ranging from 1:5,000,000 to 1:250,000 in order to delineate the exact areas suffering from drought and desertification. While this is a good beginning in terms of gaining an understanding of the extent of the macro problem, it is still necessary to build up an information base on the life-support capacities of various types of land. Furthermore, since various land use systems are dynamic in nature, it is necessary to be aware of the type, degree and direction of the changes taking place so that appropriate policy measures can be instituted for management interventions. Not until a reasonable data base has been built up which can describe and interpret the present land use systems will it be possible to identify problem areas, existing and potential, which may require immediate or future management inputs.

B. Lack of adequate skilled manpower

92. Another major constraint is the limited availability of all types of manpower skilled in planning, implementing and managing various land use and farming systems. While traditional land use and farming systems based on simple technology have been practised for centuries at suitable locations in Somalia and the Sudan, issues like the introduction of cash crop production, formal irrigation and use of high-yielding varieties, the rapid expansion of rainfed agriculture and livestock production, and the intensification of conflicts between various types of land use, are of comparatively recent origin. These issues often require extensive physical and social infrastructure, efficient management and marketing, experienced farmers and extension workers, modern technology and regular supplies of inputs. Without such inputs and support mechanisms,

expected yields from various land use practices are unlikely to be achieved. These different types of land use system have relatively few issues in common.

93. The limited availability of managerial, technical and financial resources is probably the most serious constraint to proper land use planning. Skilled manpower resources are generally scarce and those available are often improperly utilized. Professional competence is inadequate to handle the tasks facing the subsector at all but the highest levels. There is also an imbalance between the various professional disciplines required. The problem has been further compounded by the exodus of skilled manpower to the oil-exporting countries in the Middle East region, mainly due to the attraction of good financial rewards compared to the low salaries and poor career prospects at home. Paradoxically, institutional weaknesses can, to a significant extent, be attributed to the simultaneous shortages of professionals and technicians at one level and to overstaffing with inexperienced, semi-skilled and unskilled workers at another.

94. Another important aspect of efficient manpower utilization is the frequent turnover of personnel in the public sector, which means that a person trained for a particular job may not stay in it for any reasonable period of time. Rapid turnover and inadequate management information systems have also contributed to short institutional memory. Thus, often it is quicker and easier to obtain certain land use-related information from FAO in Rome than in the countries concerned.

95. Expatriate staff have often turned out to be a mixed blessing. On the positive side, they have made some contribution to certain aspects of land use planning. However, they are frequently used as a substitute for local manpower and spend much of their time performing routine duties. The weakness of the institution often renders the foreign technician, even when he is suitably chosen, somewhat ineffective. Often there are not enough adequately qualified local counterpart staff, who are supposed to receive on-the-job training and then take over when the expatriates leave. Consequently, it is not unusual to find that, once the expatriate staff have left, project performances start to deteriorate and much of the institutional memory disappears with them. Unless government employment is made more effective and a career in public service becomes more rewarding, it is unlikely that the situation will improve. At present there does not appear to be any policy framework to rectify this situation. In Somalia, however, a recent USAID-sponsored study has made some major recommendations on how to make public service appointments more effective and rewarding. These recommendations need careful evaluation and scrutiny prior to implementation.

C. Applied research

96. In spite of the fact that expenditure on agricultural research as a percentage of agricultural GDP in Africa is now substantially higher than in Asia and most of the Latin American region, the latest FAO review on Africa has concluded that "agricultural research after political independance has been of limited scope, poorly organized, badly managed and lowly funded". Similarly, the World Bank has stated that "most observers agree that the technology shelf (in agriculture) in sub-Sahara Africa is nearly bare". The situation in the area of land use and farming systems is no exception.

97. In addition to the absence of qualified staff already discussed earlier, there are many reasons for this unsatisfactory state of affairs. Among the problems are the following:

(a) Donors who pay for most of the agriculture-related research generally shape research policies, priorities and institutions with minimal national involvement. These may not reflect or match national requirements;

(b) Poor bilateral and multilateral donor co-ordination contributes to duplication of effort, confusion due to conflicting advice, and differing donor priorities, requirements and vested interests. Part of the problem arises from the fact that universities and research centres must compete for funds from different sources. Thus, donors can do much to help by co-ordinating their assistance to develop relevant research in various national institutions;

(c) Research workers are often isolated and underused, and there is also often a schism between basic research at national institutions, field trials at various research centres, and adoption of results by the farmers;

(d) Effective research is often not conducted due to lack of incentives, equipment, library and computing facilities, support personnel and on-time fund availability; and

(e) Institutional research bases are often weak and can seldom count on high-level political and bureaucratic support.

98. Any attempt to substantially improve existing land use and farming system approaches in the two countries must include more effective applied research which takes account of the tremendous heterogeneity in climate, soils, natural resource availability, development levels, institution types, and social, economic and cultural norms.

D. Inadequate planning framework

99. Currently, there do not appear to be any comprehensive national policies and legislation supporting such policies to guide and direct land use planning. A 1985 FAO report on the Sudan stated that "virtually no planning has occurred regarding the use of land resources. There is no comprehensive map depicting current land uses; there is no plan which suggests how land resources should be used in the future. Instead the emphasis within government is upon project programming rather than land use planning ... The result is a pattern of land use decisions developed in an *ad hoc* manner. Further, because no single agency is vested with the power to manage land, conflicts over land use have developed between different central government departments. Also, ... the confusion which generally exists regarding land use has sometimes been exacerbated by legislation which has transferred many land-related administrative powers from the central government to regional and local governments".

100. Successful land use planning is unlikely to take place unless there is a single institution with a clear mandate and the authority both to formulate national policy and to simultaneously ensure co-ordination among the relevant Government departments and other agencies involved with the different aspects of land use. It should also ensure that the various bilateral and multilateral agencies carry out programmes which clearly fall within the prescribed national framework and are compatible with established national priorities. Similarly, approaches and methods should not display major diversities and foreign agencies and national organizations should not plan and act independently without consulting one another, as is often the case at present.

101. Furthermore, the different national and foreign agencies associated with land use farming system projects should have long-term commitments to them until they have been successfully implemented. Proper land use studies and their implementation take time, and thus short-term approaches are likely to result in the inefficient use of scarce resources, both in funds and manpower.

VI. POLICY OPTIONS AND RECOMMENDATIONS

102. On the basis of the analysis carried out, the following policy options and recommendations are suggested.

A. Development policy and planning capability

103. Land use planning should be considered an integral part of development planning. While prior to independence, few African countries had carried out or even attempted national planning, there is increasing interest in an emphasis on macro-planning with a view to promoting better utilization of the limited resources available to achieve prescribed national objectives. At the macro-planning level, there is generally adequate knowledge, information and experience, but at the micro or operational level the situation is often just the reverse. The type of information necessary at this lower planning level in the hierarchy often does not exist and qualified professional manpower is in short supply. Thus, even when reasonable macro plans are available, it does not axiomatically follow that similar quality micro-plans can be formulated.

104. Furthermore, good land use plans can only emanate from well-formulated policies. If these policies are non-existent or are not properly articulated, it follows that land use plans formulated in such a policy vacuum cannot meet long-term national needs. It is therefore essential that policy and planning capabilities, both at the macro and at the micro levels, should be built up and this process should receive priority attention.

105. At present, it is unclear how the responsibilities for the various aspects of land use and farming systems are allocated between, and within, sectoral ministries and other bodies, both governmental and private. This lack of co-ordination gives rise to many serious problems, including gaps in coverage where no ministry or agency has adequate presence, unnecessary duplication of effort, and contradictory approaches or statements emerging from the various governmental bodies which leave the public more confused than enlightened. Lack of appropriate land use legislation and poor implementation of whatever legislation does exist

at present further complicate the situation. It is therefore proposed that greater emphasis be placed on appropriate policy adjustments and reforms which reflect the present realities in the area. Governments should consider establishing an effective co-ordinating mechanism, preferably in the Ministry of Planning. Furthermore, such a mechanism, once established, must have the authority to co-ordinate land use planning and be supported by up-to-date, realistic legislation to ensure that overall planning efforts are respected and not circumvented and that the land use decisions made are binding at all levels of government. Co-ordination between the central government and regional bodies, especially in the Sudan, should be further encouraged.

B. Resolution of land use conflicts

106. The absence of a coherent land use policy has created some confusion and has, to a certain extent, contributed to the development of conflicts between competing users of land. In the Sudan, for example, mechanized farmers have cleared forests and destroyed wildlife habitats and have also encroached upon the lands generally used by pastoralists and traditional farmers. This latter group, in turn, has increased pressure on existing forest lands from the search for fuelwood, fodder and new areas for cultivation. Domestic animals belonging to pastoralists have intruded upon areas of land used by farmers engaged in irrigation. Overall forests and wildlife habitats are under pressure from all other land users as well.

107. While there will always be a demand for land from competing users, what is urgently required is a national land use plan which properly matches the various principal characteristics of land, such as soil quality, water availability, climatic and socio-environmental considerations, with the proposed type of land use. Once the suitability of specific land areas has been determined on a scientific basis, decisions which would be consistent with long-term national needs can be made on how these areas will be used. If and when such plans exist, attempts will be made to use the land in the manner for which it is most suited. While some land can be used for various purposes, the presence of a review process and the enforcement of appropriate legislation referred to earlier, will contribute to a more optimal use of land resources and a significant reduction in conflicts over various land uses.

C. Rainfed agricultural land use

108. Even though rainfed agriculture dominates the land area under crops, in the past many development efforts were concentrated on irrigated crop production. This is particularly noticeable in the Sudan which has extensive irrigated areas. Because of this, rainfed production has been increased primarily through horizontal expansion which has proved relatively inexpensive and, in the Sudan, has often been unrestricted under the traditional land tenure system prevailing in most of the country and due to an unrealistic perception of the availability of plentiful land resources.

109. In view of the fact that rainfed agriculture offers the highest comparative advantage with the least dependence on foreign exchange, an important policy implication has to be the maximization of rainfed production, especially through yield improvement. The traditional rainfed farmers are under-privileged, mostly illiterate, lack resources and are the least organized and the least capable of taking risks. This makes rainfed agricultural land use difficult to implement through suitable policy interventions. Also, since the rainfed sector is virtually all in private hands and is thus market-oriented, the role of the private sector, at least in this context, has to be supported and encouraged.

110. In the same way, policy interventions are necessary not only to prevent the decline in soil fertility but also to restore it through appropriate crop rotation and land use practices. Research, development and extension work are necessary in order to replace old crop varieties with new strains which are more drought-resistant and require shorter maturing periods.

D. Irrigated land use

111. In Somalia and the Sudan, irrigated land use has played an important role in increasing the production of cereal and export crops. Irrigation efficiency in both countries is still low and much scope exists to improve present water use practices by proper management. Rehabilitation of existing irrigation schemes is a priority area, since the most immediate prospects for rapid production benefit and early and higher economic returns will generally lie with the rehabilitation of existing irrigated areas rather than with new construction. Accordingly, from the viewpoints of economic efficiency and national income distribution, it is necessary to develop a policy based on an appropriate mix of rehabilitation and construction of new irrigation projects. In both these cases, it is essential to overcome the problem of lack of trained manpower. Since development of skilled manpower is a long-term process, relevant plans should be made as soon as possible.

112. Small-scale irrigation projects have not received adequate attention in either country in the past. In view of the fact that they do not require major investments in physical infrastructure and that foreign exchange requirements - if any - are low and can be developed fairly quickly and at low cost, small-scale projects can be cost-effective for a wide variety of crops, including basic staples.

E. Rangelands

113. Rangelands, as discussed earlier, play an important role in the economies of both countries, and especially in Somalia. The major problem has been the deterioration of range vegetation in areas where animal populations exceed the carrying capacities of the land. Reversing range degradation and increasing or at least stabilizing livestock production will not be an easy task under the existing systems of land use and tenure. More information is necessary on the technical, sociological and economic aspects of traditional grazing systems so that appropriate policy interventions can be made to improve them.

114. It would be desirable to execute pilot projects on different forms of grazing management which would not necessarily be limited to systems presently in use. This should be effected in close consultation and collaboration with the pastoralists. The extent to which formal grazing management can play an important role in the two countries has yet to be determined. It may, however, be necessary to consider some form of rest-rotation grazing to upgrade highly deteriorated land areas.

F. Forest land management

115. Progressive deforestation in Somalia and the Sudan has serious economic, social and environmental repercussions over the long term. In addition to the factors discussed earlier, management of forest land has been largely ineffective for two other reasons. First, the over-exploitation of accessible forests has been possible because of the lack of real commitment by either Government to control it and the fact that short-term tangible gains have outweighed the long-term social and environmental costs. Fortunately, this attitude has started to change in recent years.

116. The second reason has been the absence of appropriate technical packages for reafforestation of marginal land in arid and semi-arid areas. Recurring drought, the general dearth of good soil presently available for tree planting, and the lack of adequate infrastructure have created a situation wherein it is unlikely that large blocks of plantations can be developed within a limited time period. The situation, however, is not all bleak. For example, within the 63,000 ha of the northern sector of the Gezira scheme, there are 110 km of major canals 54 km of branch canals, and 3,000 km of minor canals. If shelterbelts are developed extensively in such a system, the extent of tree planting and the resultant benefits to the region will be considerable. Similarly, serious efforts should be made to increase the area of savannah woodland by managed control, with the participation of local communities. This type of pilot scheme is being tried in Umm Belut village in Darfur.

117. It would be desirable to consider introducing mixed production systems in specific areas which may require some changes in land management. An integrated approach, based on the interaction of forestry, agriculture and pastoralism, may turn out to be an effective alternative which could reduce over-exploitation of forest and also increase agricultural and livestock yields.

118. Any forest land management plan in either Somalia or the Sudan must consider the people's fuelwood requirements. Fuelwood development plans should be based on more reliable data than are presently available and on realistic production potential assumptions, future demand, institutional capabilities and the country's capacity for absorbing external assistance.

G. Data collection and management

119. At present, the institutional arrangements and capabilities for providing planners and policy-makers with the information they require on various aspects of land use and farming systems are constrained by the lack of adequate, reasonably reliable data and also by the absence of appropriate data processing systems. Often, the full potential of any useful data which have been gathered cannot be realized because of delays in data processing and lack of published results. It is not unusual to find that some of the data which are of basic importance for making planning decisions are only published several years after the period of time to which they refer. Accordingly, such information is of limited value for planning and decision-making.

120. Two major problems have to be resolved before data collection and management problems can be overcome. These are:

(a) The lack of an adequate number of properly trained and experienced professional staff together with the heavy load of work of a mundane nature which is imposed by internal administration and by the reporting requirements of a multitude of donor agencies; and

(b) The absence of a current and readily accessible data base with satisfactory data processing facilities.

To a certain extent, both these problems stem from severe shortages of financial resources. These factors have contributed to the development of a vicious circle whereby lack of resources reduces both the extent and the quality of the data which can be collected. Users gradually lose confidence in the data bases available and start setting up their own data systems and resources available to the central organization are reduced even further. These events often lead to the establishment of several independent data systems which are often supported by donor agencies. There is little co-ordination or consultation between these various data systems and this contributes to unnecessary duplication, creation of incompatible systems and the production of inconsistent data. The continuity of some of these systems is doubtful, especially when they are set up under an aid project, upon completion of a project, and/or on departure of foreign advisors.

121. Until and unless the importance of the ready availability of reliable data in the area of land use and farming systems is recognized as an important factor by senior policy-makers, it is unlikely that the present situation will change significantly in the near future.

H. Manpower development and training

122. At present, national institutions are not properly established to develop a critical mass of good professional cadres specialized in land use and farming systems. While, as in Khartoum, universities can produce professionals in certain aspects of land use like irrigation engineering, their curricula has not so far taken into account the specific requirements of multi-faceted and multidisciplinary subjects such as land use planning and policy-making. Before

the educational institutions can embark on providing such courses, it will be necessary to consider the training of trainers. On a long-term basis, each country must develop its own educational establishments to train professionals on land use. Only then can it respond quickly to changing national requirements and priorities, training people and conducting research according to national needs. Overseas training is not only expensive but also it may not properly reflect national requirements. Ideally, overseas training should be limited to those professional staff who have already had education and training at home but who require specific skills for which training is not available locally. One reason it is not available may be because the number of professionals to be trained in that area is so limited that it does not make sense economically to develop training facilities. If professionals are being sent for external training, measures should be taken to ensure that they actually return to work in their home country for a reasonable period of time and that the tasks assigned to them on return are commensurate with their training.

123. Training requirements on land use and farming systems at the various national institutions should be systematically identified, along with manpower requirements. Manpower development and training plans for professional and technical staff should form an integral component of all land use and educational sector plans. On-the-job training should be encouraged and staff selected for training should be selected with care.